

## INFLUENCE OF THE MOON ON WEATHER.

In connection with the interesting preliminary report by Director Köppen, translated on another page, it may not be out of place to here mention an elaborate discussion of the moon's influence on weather by Dr. Gotthold Wagner.<sup>1</sup> His memoir begins with a thorough discussion of the history of the development of a belief in the moon's weather influences, tracing the idea from its earlier forms preceding Babylonian astrology, up through Greek astrology and "meteorology" until the Ptolmaic astrology passes over into the modern ideas of weather forecasting by suppositious lunar influences. The second half of the memoir presents in some detail a critical summary of modern and truly scientific investigations regarding possible lunar influences on terrestrial weather and concludes with the following paragraphs.—

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We have here refuted the popular belief that the lunar influence is sufficiently strong to permit of its direct, unaided observation, and that one can even deduce weather forecasts from it. The repeated assertion that the popular belief is based upon observation is incorrect. This belief is rather the offspring of a primitive religion, and it has been forced upon the people by a science that imagines it can replace exact observations by logical speculations. This idea must be in the minds of those who, believing in the supposed wisdom of the populace, continually repeat the attempts to construct a system of weather prophesies. They scarcely succeed in devising a system that has not previously been tried in whole or in part, and has therefore already been refuted.

The recognition of this fact is not without significance for science also. Thus if, for example, it has been shown that the very nature of its origin vitiates the "rule" that the moon causes humidity or moisture, then there is no use of again refuting it by means of painfully compiled observations. Simultaneously the incentive to similar investigations regarding temperature, cloudiness, and precipitation vanishes, and all the more readily because all such efforts in the past have failed to attain any satisfactory results.

On the other hand, compilations of atmospheric pressure observations have shown that there is at least a possibility of discovering laws of a tidal movement in the atmosphere. All the compiled observations for tropical latitudes agree in showing a very regular, though not very large, semidiurnal wave. In higher latitudes the tidal features seem to become more complicated. The semidiurnal wave seems to be displaced by a wholly diurnal wave. This calls for new, extensive investigations which shall, if possible, trace the march of the atmospheric tides along a sector of a meridian. It is not improbable that such a procedure would reveal such conditions, as may be inferred from the works of Garrigou-Lagrange and Poincaré.

Studies of the influence of the moon in the individual months are considerably less certain and satisfactory;

they do, indeed, suggest a certain regularity, but furnish one with no certainty. For his part, the writer would suppose that the ground for this uncertainty arises from the manner of formulating the problem and the methods of study. Heretofore the monthly pressure-march has been studied through the daily means, while assuming as a matter of course that the moon modifies the daily means. What would be the result if, in the course of a month, it were only the amplitude and the phase of the lunar daily tide that varied? Were this the truth, then compilations of daily means could reveal regularities only in a strongly masked form, if they could show at all.

My own compilations have shown that we are quite justified in doubting the propriety of the above assumption. Daily mean pressures at Batavia for 26 years show not the slightest regularity in curves, and an investigation of the change of the atmospheric tides gave a clearly marked regularity in the change in phase of the amplitude. These results, Garrigou-Lagrange's discovery that there was an extensive change in the tides such that in the course of a sidereal month they were converted into their precise opposites, and further the published compilations of the Batavia observations, make it necessary to change the method of compilation—resulting in an unexpected increase in labor. First of all one must investigate simultaneously the changes in the lunar-day tide and the daily mean for each of the different months, determining which of the two elements is the variable. At first sight this seems to imply an extraordinarily great increase in labor; but it appears practicable if one applies a method customarily followed in computing the marine tides.

First, the observations made according to solar time are transformed into lunar time. Hereby it is quite sufficient to use in place of a lunar day 24 successive solar hours, only taking care to begin the count with the upper culmination. The observations are set down on strips, each of which stands for a lunar day; each strip must show the year, the day, and the hour of the culmination; also when possible, declination, moon's phase, perigee and apogee. Such a strip would read as follows:

1905, Oct. 5.	12 <sup>h</sup> +22°A.	☉	3.4 mm	3.7	. . .
1905, Oct. 6.	13 +20°.	☉	4.2 mm	4.5	. . .

With this arrangement the investigation is now readily carried out. First, adding the figures for the lunar days as they thus stand one beneath the other, there results the mean march of pressure for a lunar day proper, that is, the regular tidal movement. Since the horizontal lines would be added in any case for checking, one also secures at the same time the daily mean.

To study the sidereal month, it is only necessary to select the days having the same declination, place them one below the other and add. Thus results the lunar daily wave for each declination and simultaneously the mean of the lunar day for each declination. In this connection it might prove worth while to sort the days of the same declination into those when the moon is nearing the lunistice or the Equator.

In just the same way the daily strips may be arranged to study the anomalistic and the synodical months.

<sup>1</sup> Wagner, Gotthold. [Influence of the moon on the weather.] Beiträge zur Geophysik, Leipzig, 1913, 12., 2. Hft., p. 277-328; 4. Hft., p. 528-587.